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3.0 CRITICAL LIFTS

3.1 SCOPE

This chapter includes guidelines, rules, and requirements applicable to critical lifts and describes the planning and documentation required to perform a critical lift. This chapter also summarizes ordinary (non-critical) lifts for which special precautions are required.

3.2 CRITICAL LIFT DETERMINATION

The manager who has responsibility for the item to be lifted has the authority to require that it be handled as a critical lift. In addition, the manager at the facility where the lift will be performed also has the authority to require that it be handled as a critical lift. The manager who designates a lift as a critical lift shall ensure that a designated leader (DL)/lift director be assigned.

3.3 CRITICAL LIFT DESIGNATION

Critical lift designation implements administrative and physical controls to minimize the possibility of equipment failure or human error to a hoisting or forklift operation involving a load that poses unacceptable consequences if mishandled. A lift shall be designated as a critical lift when any of the following criteria are met, unless otherwise specifically defined in safety basis.

1. If loss of control of the item being lifted would likely result in declaration of a "Site Area Emergency" or "General Emergency" as defined in the facility emergency plan or construction site emergency plan.

All Department of Energy (DOE) facilities are required to have an emergency plan based on potential accident scenarios resulting in radiological or chemical releases per DOE-O223, *Emergency Plan Implementing Procedure*. Each facility shall determine the potential release quantities in the event of the loss of control. Designate the lift as a critical lift if the potential release could result in a "Site" or "General" emergency. For construction sites apply requirements in 29 CFR 1910 and/or 29 CFR 1926.

2. The item being lifted is unique, vital to a system, facility, or project operation, and if damaged would be irreplaceable or not repairable. .
3. The cost to replace or repair the item being lifted, or the delay in operations of having the item damaged would have a negative impact on facility, organizational, or DOE budget to the extent that it would affect program commitments.
4. The item, although non-critical, is to be lifted above or in close proximity to a critical item or component.
5. The load being lifted is 80% or more of a mobile crane's gross load chart rating. (Example: 100 ton crane lifting 80 tons or more)
6. Two mobile cranes are lifting the load and the load share equals more than 70% of one or both crane's chart rating for the maximum radius that will be experienced.

3.3.1 Critical Lift Content

A Critical lift designation provides:

- Documented step-by-step instructions (see Section 3.5, *CRITICAL LIFT PLAN*)
- Sign-off approvals for technical, management, safety, and engineering.
- Independent pre-identification of load weight, load center of gravity, lift attachment points, and lifting hardware minimum capacities (slings, below-the-hook lifting devices, shackles, etc.) that will be used for the lift or series of lifts.
- Independent pre-identification of crane(s) or fork lift(s) with minimum capacities identified for configuration to be used.
- Evaluation of hazards associated with the lift that may include, but is not limited to, environmental, ground support, power lines, and physical obstructions.
- Pre-identified special limiting or stop-work conditions.

3.4 CRITICAL LIFT EQUIPMENT AND HARDWARE

3.4.1 General

Before making a critical lift, the DL/lift director shall ensure that equipment (cranes, hoists, forklift trucks, rigging etc.) periodic inspections are current, a pre-use inspection has been performed and that rated-capacity/proof/load tests have been performed for slings, rigging, rigging hardware, and below-the-hook devices. (Exceptions apply to manufacturer-installed rigging hardware. See paragraph 3.4.1.1.) The DL/lift director shall confirm through communications with management or reviewed documents that personnel performing the lift are currently qualified for the assigned task(s).

3.4.1.1 Manufacturer-Installed Rigging Hardware on Engineered Equipment

Engineered equipment with manufacturer-installed rigging hardware (eyebolts, swivel hoist rings, etc.) should be purchased with load-test documentation supplied. Rigging hardware on engineered equipment, installed by the equipment manufacturer, without test documentation, may be used if approved by a rigging specialist or qualified engineer and inspected by a qualified inspector before use.

3.4.2 Rigging for Critical Lifts

The rigging components (slings, rigging hardware, below the hook lifting devices) to be used in critical lifts shall be rated-capacity/proof/load tested as specified in applicable American Society of Mechanical Engineers (ASME) Standards. Rigging components that have been tested shall be marked or tagged by the user, a third party, or the manufacturer to verify the rated-capacity/proof/load test (see examples in applicable chapters for the specific equipment). Documentation shall be traceable to the rigging component. Traceability may be accomplished by placing a tag or other permanent marking on the hardware. The manufacturer, the user, or a third party may perform load/proof tests. Tags or other permanent marking fulfill documentation requirements without paperwork. Below-the-hook lifting devices require rated load test documentation be kept in the devices history/maintenance file (see Chapter 11, *Below-the-Hook Lifting Devices*).

3.4.3 Rigging Requirements for Critical Lifts

Each rigging component shall be qualified in accordance with Section 3.4.2. Rigging for critical lifts may include the following and shall meet the requirements found in the referenced chapter (including testing and marking requirements).

1. **Wire Rope Slings**, See Chapter 9, *Slings*, and ASME B30.9 for wire rope sling requirements.
2. **Alloy Chain Slings**, See Chapter 9, *Slings*, and ASME B30.9 for alloy chain slings requirements.
3. **Metal Mesh Slings**. See Chapter 9, *Slings*, and ASME B30.9 for metal mesh slings requirements.
4. **Synthetic Web Slings**. See Chapter 9, *Slings*, and ASME B30.9 for synthetic web slings requirements.
5. **Synthetic Rope Slings**. See Chapter 9, *Slings*, and ASME B30.9 for synthetic rope slings requirements.
6. **Synthetic Round slings** See Chapter 9, *Slings*, and ASME B30.9 for synthetic rope slings requirements.
7. **Rigging Blocks**. See Chapter 10, *Rigging Hardware*, and ASME B30.26 for rigging block rated load test requirements.
8. **Shackles**. See Chapter 10, *Rigging Hardware*, and ASME B30.26 for shackles requirements.
9. **Eyebolts**. See Chapter 10, *Rigging Hardware*, and for eyebolts requirements.
10. **Rings, links and swivels**. See Chapter 10, *Rigging Hardware*, and ASME B30.26 for rings requirements.
11. **Swivel Hoist Rings**. See Chapter 10, *Rigging Hardware*, and ASME B30.26 for swivel hoist rings requirements.
12. **Turnbuckles**. See Chapter 10, *Rigging Hardware*, and ASME B30.26 for turnbuckles requirements.
13. **Below-the-Hook Lifting Devices**. See Chapter 11, *Below-the-Hook Lifting Devices*, and ASME B30.20 & BTH-1 for requirements and for requirements imposed by ANSI N14.6 when applied.
14. **Dynamometers and Precision Load-Position Devices (hydro-set)**. Load test at maximum capacity.

NOTE: *The tolerance for load tests/proof tests is +0, -5%. If the hardware manufacturer recommends loads greater than those listed in the referenced ASME standard, the manufacturer's recommendations should be followed.*

3.5 CRITICAL LIFT PLAN

A step-by-step plan or work instructions shall be prepared and approved by the technical approver, qualified rigging engineer, qualified occupational safety representative, and manager (see 3.5.1). Critical lift plans shall be stand alone documents with all required information and approvals. The DL/lift director shall have the critical lift plan at the work location during the lift(s).

Critical lift plans shall contain documented step-by-step instructions and drawings (see example drawings in Attachments 3-1 thru 3-4 and the Critical Lift Plan Development Guide in Attachment 3-5) containing:

1. Identity of the item(s) to be lifted.
2. Special precautions, if any (such as mats for mobile cranes).
3. Weight of the item and total weight of the load (For mobile cranes, see the manufacturer's instructions regarding components and attachments that must be considered as part of the load).
4. A list that specifies each specific piece of equipment (e.g., crane, hoist, fork truck), accessory, and rigging component (e.g., slings, shackles, spreader bars, yokes) to be used for the lift. This list shall identify each piece of equipment by type, size, and rated capacity. When a lift plan identifies multiple cranes, forklifts, or rigging components that may be used for the lift(s), the plan shall require verification of the specific ones used for the lift(s).
5. Identification of hazards associated with the lift that may include but are not limited to environmental, ground support, physical obstructions, power lines, crush/pinch points/struck-by hazard, etc.
6. Identification of essential personnel that may be permitted in the fall zone to perform work that cannot be done otherwise (such as rigging or guiding the load), including but not limited to, Health Physics Technician (HPT), Nuclear Chemical Operator (NCO), or Industrial Health (IH). (See Chapter 17, *Interpretations*, for DOE interpretation).
7. Designated checkpoints or hold points and estimated instrument readings, as relevant, so that job progress can be checked against the plan.
8. Hold points or sign-off points for personnel assigned to witness the work. Sign-offs (initial/date) in the plan as key steps shall be completed or validated.
9. Rigging sketch(s), which include the following: (See example Attachments 1-4)
 - a. Dimensions of item to be lifted, including center of gravity
 - b. Lift point identification
 - c. Method(s) of attachment and hitch configuration for slings
 - d. Capacity and tension on slings, rigging hardware, and lifting devices at the configuration shown
 - e. Sling angles
 - f. Accessories used (softeners, dunnage, etc)
 - g. Other factors affecting the equipment capacity such as, but not limited to, D/d ratio or temperature when applicable
 - h. Rated capacity of the cranes or forklifts in the configuration(s) in which it will be used. For mobile cranes, many factors affect rated capacity, including boom length, boom angle, and work area (radius). Forklift attachment(s) that effect capacity shall be identified.
 - i. A Pre-identified load-path sketch that shows the load path and height, when applicable. For lifts with mobile cranes, include the crane position(s) relative to the load and relative to surrounding obstructions. Where appropriate, include floor or soil-loading diagrams.

- j. A note(s) indicating lifting, travel speed, and height limitations, when applicable. This may be noted on the load-path sketch or on a separate sketch.
10. Approvals by technical approver, management, qualified safety representative, and qualified rigging engineer. (See Chapter 2, *Responsibilities*, Section 2.9, *Approvers of Hoisting and Rigging Lift Plans*.)
11. A list of required personnel assignments and/or responsibilities.
12. Verification of personnel qualifications (this may be accomplished via communications with management or reviewing documents).
13. A sign-off to document verification that equipment (cranes and forklifts), rigging, hardware, and below-the-hook lifting device inspections, periodic and pre-use, are current and have been subjected to testing as required in the applicable chapter.
14. Verification that installed lifting or attachment points have been inspected.
15. Pre-identified stop work conditions such as, but not limited to, weather or other conditions that would require termination of the lift.
16. Requirement to perform operational test of functions of the crane through the full range of movements that will be used to perform the lift(s). The test shall be performed with the crane set up in the exact configuration as will be used to perform the lift or series of lifts with no load on the hook.
17. Documentation of lift and pre-job meeting.
18. Copies of any completed Electrical Utilities Electrical Site Visit form(s) or ground scans when applicable to the lifting activity for mobile cranes and forklifts.

NOTE: *Although individual plans are prepared for one-time critical lifts, more general (multi-use) plans may be employed to accomplish recurring critical lifts. For example, a general plan may be used to lift an item or series of similar items that are handled repeatedly in the same manner. Several or multiple lifts of various loads may be contained in one critical lift plan.*

3.5.1 Critical Lift Plan Approval

The critical lift plan or work instructions should be approved as required by the responsible contractor's processes and, as a minimum, shall be signed and dated by the following:

1. Technical Approver (see Appendix A for definition)
2. Manager responsible for the item to be lifted
3. Qualified Rigging Engineer
4. Qualified Safety Representative

NOTE: *See Chapter 2, Responsibilities, Section 2.9, Approvers of Hoisting & Rigging Lift Plans.*

3.5.2 Critical Lift Plan Field Revisions

Critical lift plan or work instruction field revisions shall be accomplished by drawing a single line through the original (deleted) text and inserting the field revision close to the deleted text. The field revision shall be initialed and dated by the person(s) making the revision. Text shall not be obliterated by the use of correction fluid, correction tape, scribbling, erasure, or any other method. Field revisions should be approved as required by the responsible contractor's plans. Field revisions may be confirmed by telephone and shall be signed and dated within two working days of the field revision. As a

minimum, critical lift field revisions shall be signed and dated in the margin of each revised page by all of the following.

1. Manager of the lifting operation or facility manager
2. DL/Lift Director
3. Qualified Rigging Engineer
4. Qualified Safety Representative

3.6 PRELIFT AND FIELD REVISION REVIEW MEETINGS

Before performing a critical lift/multi-crane special lift, and immediately following a field revision, participating personnel shall meet to accomplish the following.

1. Review the critical lift/multi-crane special lift plan or field revision
2. Discuss any hazards, controls, hold points, coordination with other work groups, unique conditions, and emergency contingencies
3. Resolve questions before beginning work

3.7 CRITICAL LIFT DOCUMENTATION AND RECORD RETENTION

As a minimum, documentation of each prelift and field revision meeting shall include an attendance roster showing the meeting time and date and a list of attendees. The DL/lift director or facility-assigned person shall retain meeting documentation until the lift is satisfactorily completed. When the job is finished, the DL/lift director or facility-assigned person shall transmit the critical lift documentation to the manager for whom the lift was done. This documentation is subject to audit for one year after the lift is completed.

Documentation of a critical lift shall include the following.

1. The critical lift plan, recording job completion with approval signatures and hold point sign-offs as applicable. The critical lift plan shall include documentation of the pre-lift meeting.
2. Documentation of the pre-lift meeting; containing, at a minimum, the meeting date and list of attendees.
3. Any additional documentation deemed appropriate by management.

3.8 SPECIAL LIFTS – NON-CRITICAL LIFTS THAT REQUIRE SPECIAL PRECAUTIONS

This special lift section identifies elements of chapters in the manual that contain additional requirements when performing specific hoisting and rigging (H&R) activities and allows elements of the critical lift requirements to be adopted at management's discretion to provide additional administrative and physical controls. As addressed in other parts of this manual, certain lifting operations require special precautions. Special precautions are required under the following conditions:

1. A mobile crane is working near power lines or transmission towers (see DOE-0359, *Hanford Site Electrical Safety Program*, Section 5.12, *Mobile Cranes Operating near Energized Overhead Lines*).
2. A forklift is working near power lines or transmission towers (see DOE-0359, *Hanford Site Electrical Safety Program*, Section 5.10 *Planning Work that has the Potential to be within 20 Feet of Overhead Lines*, and Section 5.11, *Performing Work within 20 Feet of Overhead Lines*).
3. Personnel are being lifted with cranes or forklifts. For mobile cranes, follow the requirements found in Chapter 15. For forklift trucks, follow the requirements found in Chapter 6.

4. Two or more cranes will be used to make a lift. An approved lift plan shall be required (29 CFR 1926.1432). For hoists, jib cranes, and monorail systems, follow requirements found in Chapter 12, *Hoists, Jib Cranes, and Monorail Systems*. For overhead and gantry cranes, follow the requirements found in Chapter 13, *Overhead and Gantry Cranes*. For mobile cranes, follow the requirements found in Chapter 14, *Mobile Cranes*. Ensure the lift plan is developed by a qualified person and approved by a technical approver, management, a qualified safety representative, and a qualified rigging engineer (see Chapter 2, *Responsibilities*, Section 2.9, *Approvers of Hoisting and Rigging Lift Plans*). Pre-job meeting requirements must be met (Section 3.6).
5. Mobile crane pick and carry operations, follow requirements found in Chapter 14, *Mobile Cranes*.

3.9 PRE-ENGINEERED LIFTS

Independent pre-identification of load weight, load center of gravity, lift attachment points, and minimum lifting hardware capacities (slings, below-the-hook lifting devices, etc.) that will be used for the lift or series of lifts for noncritical items shall be provided at management discretion. This includes, but is not limited to, the following:

- Handling large or unusually configured loads outside a fork truck's load center. Follow the requirements found in Chapter 6, *Forklift Trucks*, paragraph. 6.12, item d.
- Loads close to an existing building or operating equipment that if dropped or upset would cause damage to building or equipment.
- Non-routine rigging configurations being used or items requiring special care because of size, weight, close-tolerance installation, or high susceptibility to damage.

ATTACHMENT 3 - 1

Forklift Travel Path Sketch

EXAMPLE

Sketch #1- Box XXXX

Location of box: 218-W-4C, Trench 7

Destination: Relocate Waste Box to Provide Access for Loading
on to IP-1 Shipping Container

Box dimensions: 16'- 0" long 9'-0" wide x 10' 8" high

Box weight: 10,900 lbs

Estimated box center of gravity is at geometric center of box

Forklift: Taylor Model TE520-M (HO-75-4713) Equipped with

Forklift Lifting Device FKLD- YYYY-001 (One on each Fork)

capacity 14,000lbs each, weight 400 lbs each

Technical approver

Date

Manager Responsible for item to be lifted

Date

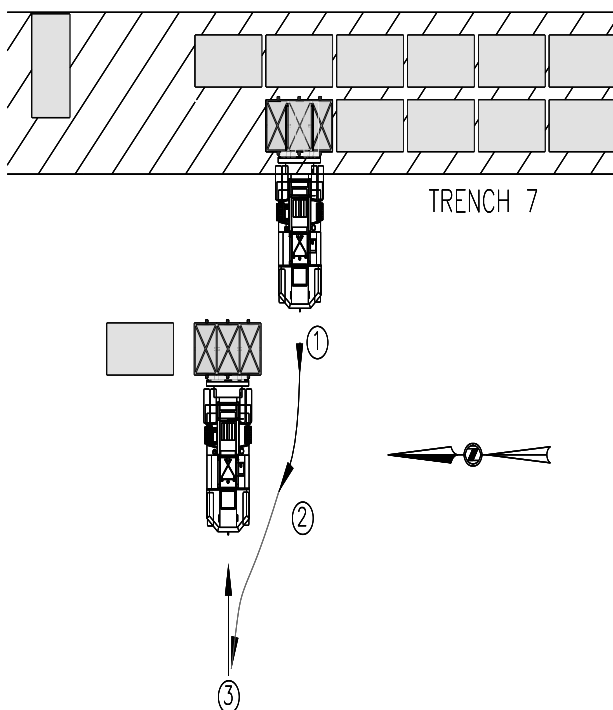
Qualified rigging engineer or assigned

Date

Qualified Occupational safety representative

Date

1. Pick up box in Trench 7 and back north approximately 10 feet.
2. Back North East approximately 15 feet.
3. Move forward to align box as directed by PIC. Leave at least 5 feet between waste boxes



ATTACHMENT 3 - 2

Forklift Loading & Lifting Point of Reference Sketch

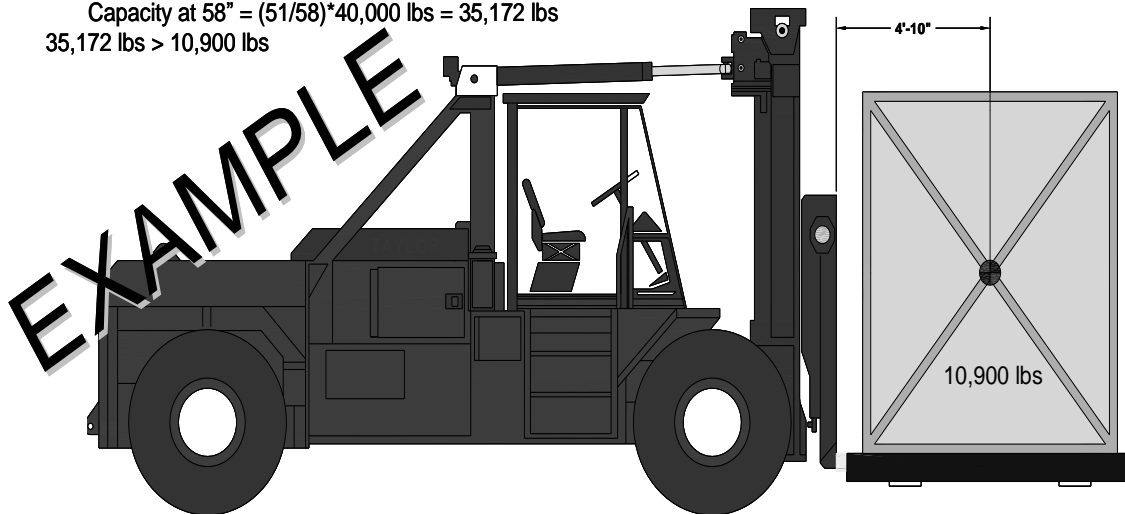
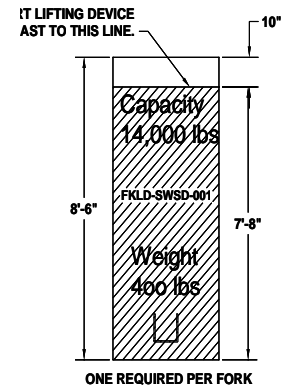
Sketch #2- Box XXXX

Location of box: 218-W-4C, Trench 7
 Destination: Relocate Waste Box to Provide Access for Loading
 on to IP-1 Shipping Container
 Box dimensions: 16' 0" long 9' - 0" wide x 10' - 8" high
 Box weight: 10,900 lbs
 FKLD-YYYY-001 fork attachments 2, capacity 14,000lbs each,
 weight 400 lbs each

Estimated box center of gravity is at geometric center of box
 Forklift: Taylor Model TE 520M Y 350D (HO-75-4173)
 Forklift Capacity with FKLD-YYYY-001 installed 40,000 @ 51
 inches from face of fork.

Capacity at load center of 58 inches

Capacity at 58" = $(51/58) * 40,000 \text{ lbs} = 35,172 \text{ lbs}$
 $35,172 \text{ lbs} > 10,900 \text{ lbs}$

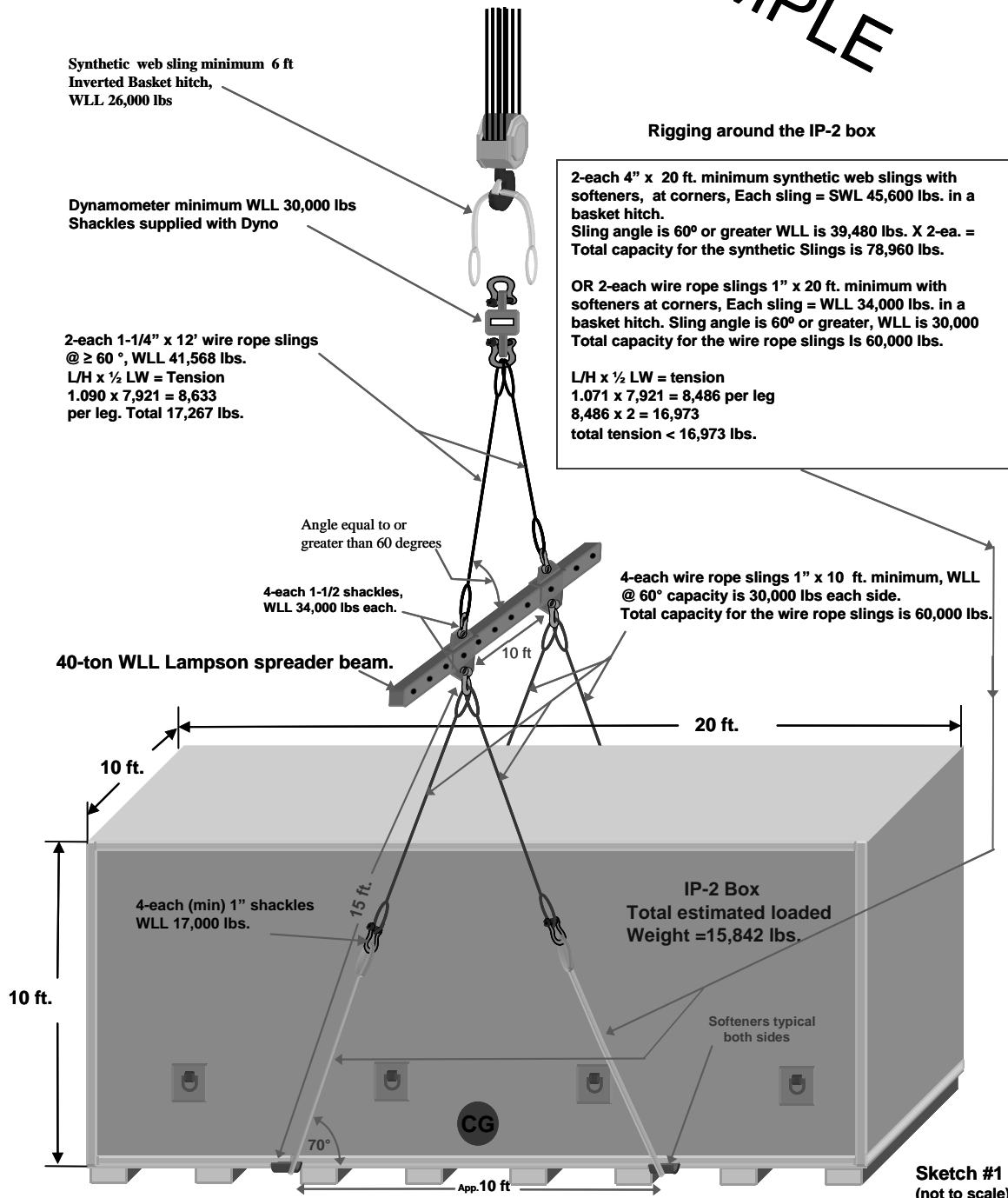


ATTACHMENT 3 – 3

Rigging Sketch

Exact orientation and equipment location of the crane, load and IP-2 box container shall be determined by the DL and the FWS. Always refer to the Mobile crane load capacity chart for allowable crane and rigging hardware load deductions and the cranes lifting capacity parameters. Do not exceed the crane capacity load chart.

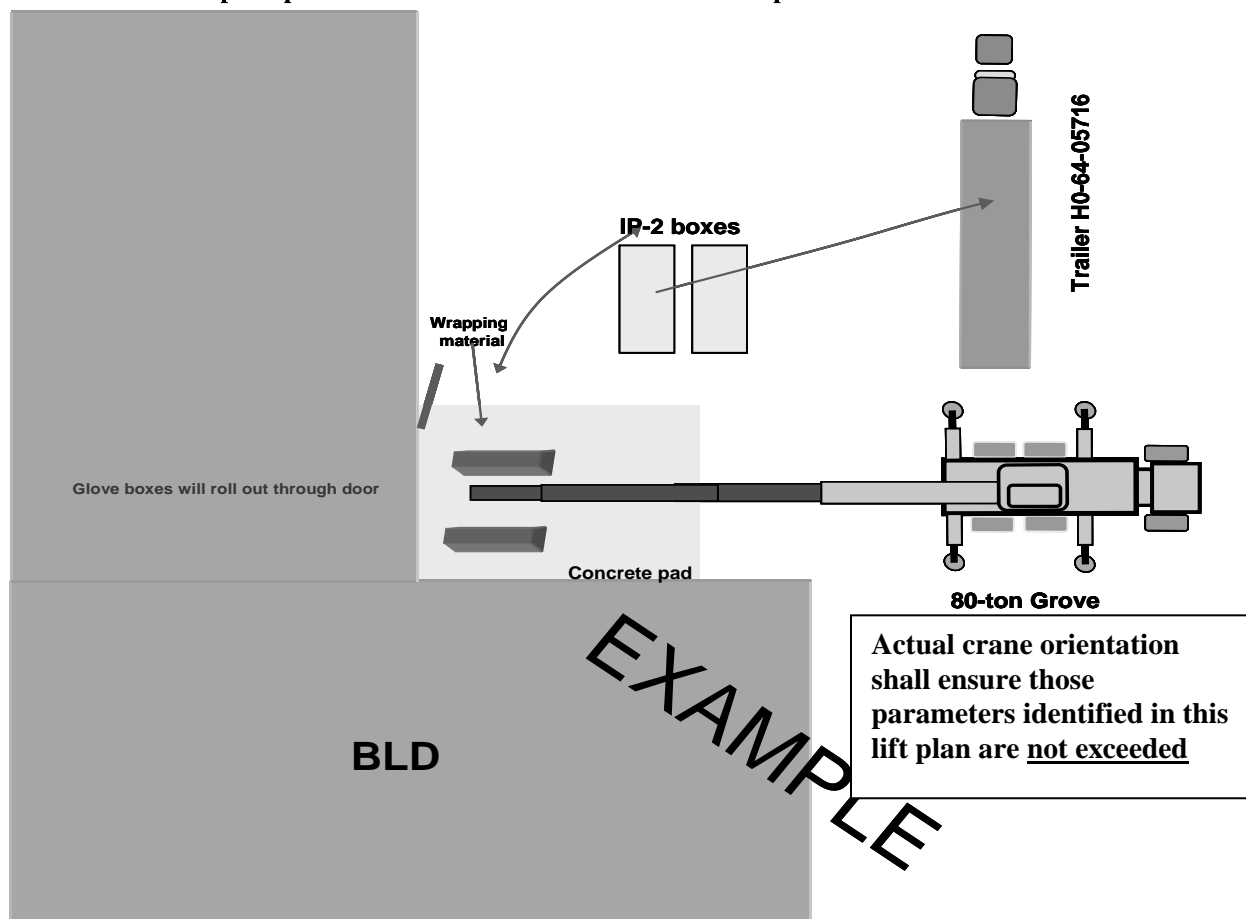
EXAMPLE



ATTACHMENT 3 – 4

Load Path / Crane Capacity Parameters

Exact orientation and equipment location shall be determined by the DL and FWS.
 The crane can be repositioned for the lifting the glove boxes or the loaded IP-2 boxes.
 The glove boxes will be rolled outside and lifted (1st lift) and set onto wrapping material.
 Once wrapped and secured, lifted (2nd lift) again and placed into the designated IP-2 box.
 Once the IP-2 box cribbing and lid is secured each IP-2 box (3rd lift) will be loaded, one per shipment on to trailer HO-64-05716 and secured for shipment.

**IP-2 Lifts**

80-Ton Grove mobile crane, 360°,
 @ 45 ft. radius, 96 ft. maximum
 Boom (61°) boom angle,
 Crane capacity is 25,450 lbs.

Loaded IP-2 box	15,842 lbs.
Hook Block	1,965 lbs.
Ball	750 lbs.
Jib stowed	926 lbs.
Aux. boom head	230 lbs.
Spreader bar	775 lbs.
Dynamometer	300 lbs.
Shackles	90 lbs.
Rigging slings	200 lbs.
Total weight	21,078 lbs.

Glove Box Lifts

80-Ton Grove mobile crane, 360°,
 @ 70 ft. radius, 87 ft. (32°) (min) boom,
 114 ft. (51°) (Max) boom,
 Crane capacity is 10,150 lbs.

Each glove box	4,500 lbs.
Hook Block	1,965 lbs.
Ball	750 lbs.
Jib stowed	926 lbs.
Aux. boom head	230 lbs.
Spreader bar	775 lbs.
Shackles	90 lbs.
Dynamometer	300 lbs.
Rigging slings	200 lbs.
Total weight	9,736 lbs.

Sketch #3
 (not to scale)

ATTACHMENT 3-5**Critical Lift Plan Development Guide****Mobile, Bridge, Gantry Cranes and Forklift Critical Lift Planning Recommendations**

Critical Lift Plans (CLP) require more extensive planning and oversight by qualified persons and are thus, a more formal approach to planning. A CLP shall be prepared and approved by qualified persons to minimize the potential of a crane failure (stability or structural). Depending on the complexity of the crane lift, the formal CLP may involve several pages (including drawings of the crane and/or the load, load charts, crane set-up, etc.) to document the necessary information pertaining to the cranes configuration, accurate load and rigging information, and the crane's rated capacity.

This attachment should be used as a guide to assist the lift plan author in evaluating specific factors of a lift. Mandatory requirements shall always be followed as defined in the DOE-RL-92-36 Hanford Site Hoisting and Rigging Manual, Occupational Safety and Health Administration (OSHA), and the American Society for Mechanical Engineers (ASME) B30 standards. The CLP should be formatted to include all the underlined header topic items for standardized procedural/plan formatting and uniformity. The information included under each header topic item shall be evaluated and consider as significant or non-significant. All necessary subject matter information shall be included in the CLP and a clear and prescribed representation given as to the direct significance it represents to the lift development. Other essential subject matter items may be required depending on the circumstances of each lift.

Approvals

At a minimum, the CLP shall be signed and dated by the following people:

- Technical approver
- Manager responsible for item(s) to be lifted
- Qualified Rigging Engineer
- Qualified Safety Representative

The CLP is to be approved as required by the responsible contractor's processes and procedures, which may require additional signatures.

1.0 PURPOSE/SCOPE(topic header item)

The purpose of this procedure is to provide hoisting and rigging (H&R) instructions for:

Give a description of the load to be lifted and any other relevant information required to make the lift, including adjacent equipment, trucks/trailers, buildings or structures that might have an effect on the lift or placement of the load.

2.0 REFERENCES (topic header item)

All references should be retrievable. If the information is not retrievable then the information should be attached to the CLP.

- DOE/RL-92-36 Hanford Site Hoisting and Rigging Manual
- Design calculations of the lifted item
- Drawings of added value to assist with making the lift
- Vendor instructions and facility/operations procedures
- Soil test reports
- Applicable facility or organizational specific requirements
- Other related documents that may provide information

3.0 **PERSONNEL REQUIREMENT(topic header item)**

DOE/RL-92-36 Section 4.0 identifies the Personnel Qualifications and Training Requirements. Each company or contractor should have a program in place to ensure that the required training is provided and the training records are available. These personnel should include:

- Riggers, Truck driver(s) as needed
- Crane Operator(s)/Forklift Operator as needed
- Signal person(s) or flagman(s)
- Designated Leader (DL)/Lift Director-- A qualified rigger or recognized rigging authority with H&R experience selected by the employer to advise and supervise H&R activities
- Designated Contact- Field Work Supervisor- (FWS) -- The interface person between the DL/lift director and the facility or organization

4.0 **MATERIALS TOOLS AND EQUIPMENT (topic header item)**

All the required rigging hardware, lifting devices, the lifted item, tools, and equipment need to be identified (listed) here and may be called on the rigging sketch(s). The CLP should require verification of code compliance for certain items such as lifting devices (to be labeled in accordance with ASME B30.20) and rigging hardware (to be in accordance with ASME B30.26).

Equipment:

- Crane/forklift identified by type and size
- Truck/trailer, as required
- Type, size, and rated capacity identified for all equipment and hardware
- Department of Transportation (DOT)/Safety Analysis Report for Packaging (SARP) tie-down requirements, if any

Multiple crane lifts

Lifting one load simultaneously with several cranes is considered beyond the scope of normal crane operations. This activity greatly increases the danger of both overloading and side loading a crane. It has been viewed as acceptable to undertake such lifts if a crane's working rating is reduced by approximately 25%. Such a reduction can give a false sense of security and does not ensure the success of a tandem lift if proper procedures are not followed. No simple checklist can provide a user with sufficient background to safely attempt a tandem lift. A formal lift plan (critical or special) shall be written for all two crane lifts. The plan shall identify the weight and center of gravity. The following factors are critical in evaluating tandem lifting. This list is intended to supplement the factors listed for a heavy lifting with a single crane. These factors are only an aid for qualified personnel in carrying out such lifts.

Things that should be considered are:

- Will the load be shared in proportion to each crane's rated capacity?
- How will the load distribution between cranes be controlled?
- Will electronic load indicating or load limiting systems be available to monitor the load on the cranes?
- If plans require cranes to carry equal loads can the rigging be set up to insure load equalization between the cranes?
- Will the swing brakes and locks be released on all cranes to help prevent side loading when lifting?
- Will all crane booms face a parallel direction when lifting to prevent side loading if booming (luffing) is required?
- Has one person been assigned to monitor the plum condition of each cranes hoist line during the lift?
- Will all operators have visual contact with the Flagman during the entire lift?
- Is some crane de-rating necessary to compensate for the inability to eliminate all coordination problems with equipment or control procedures?
- Has the selection of crane movements of each crane during the lifting operation been determined?
- No motion should be combined with travel. The cranes can hoist together as needed, and any time that one crane swings, travels, or luffs it will be necessary for the other crane to move synchronously in order to keep the load lines plumb.
- Ideal situation using two cranes would be a lift of uniform weight, using identical cranes which are symmetrically attached. Each crane would be equally loaded, load lines kept plumb, and they will remain equally loaded while in the air. The cranes will remain within their rated radius.

Lifting device

Below-the-hook lifting devices are in good condition, have traceable documentation with current inspection and load test date, and marked by manufacturer with name or trademark, rated capacity, weight if over 100 pounds, drawing number and serial number when applicable.

- Insure lifting devices are properly labeled
- Insure lifting device history file with load tests are on file
- Lifted Items
- Identified weight:
- Identify center of gravity
- Identify lift points

Hardware and Rigging for the lift:

- Shackles
- Wire rope
- Bridle slings: 2, 3 or 4-leg, rated spreader bar or special lifting fixtures identified, inspected and certified.
- Ensure all rigging hardware complies with temperature limitations as per DOE/RL-92-36 Chapter 10.0, *Rigging Hardware*, and ASME B30.26, *Rigging Hardware*.
- Threaded eyebolts have proper thread engagement and torque per manufacturer requirements.
- Consult manufacturer if rigging hardware will be used in a chemically harsh environment.
- Load tests have been performed on all required rigging hardware and hardware is properly tagged.
- Softeners specified as necessary.
- Dynamometers and torque wrenches are within current calibration, have traceable documentation or tagging with load test date, and marked by manufacturer with name or trademark, and rated capacity.
- Other tools and equipment as necessary:
- Tag lines as required
- Radios as required

5.0 PRECAUTIONS AND LIMITATIONS (topic header item)

Generally all of the following precautions should be included in the CLP. Always emphasize and include in the CLP the statement that “If this procedure cannot be performed as written, stop work. Return equipment to safe configuration and inform the field work supervisor (FWS) that the procedure cannot be performed as written, and a revision or field change notice is required.”

- Rope off or barricade area to define the critical lift area as directed by the DL/lift director to prevent the entry of unauthorized personnel.
- No personnel at any time shall be permitted to position themselves under the load.
- Ensure all rigging hardware and equipment is verified for operation and use at the low temperatures as identified in DOE/RL-92-36 and ASME B30.26.
- Special requirements, and/or manufacturer's requirements or other required information (see section 7.0 below) pertaining to the lift has been considered.
- Evacuation routes, contingency plans, emergency procedures have been determined.
- Points of no return in the lift process should be defined. These points should clearly identify the actions to take to place beyond these points to place the load in a safe configuration (i.e. lifting over the edge of a hole or building roof). Before this point the safe condition maybe setting the load on the roof on donnage after that point it will require it going to the ground or even leaving it suspended.

6.0 PREREQUISITES (topic header item)

Prior to making a critical lift, a functional/operational test shall be performed on all functions of the crane through the full range of movements that will be used to perform the lift. The test shall be performed with the crane set up in the exact configuration as will be used to perform the lift or series of lifts with no load on the hook.

For mobile cranes physically take the measurement from the cranes center of rotation to the loads center of gravity. This measurement can be checked against the cranes LMI system.

Identify power lines and obstructions in swing radius, load, and travel path of the crane. Verify Electrical Utilities is notified the day of the lift per Hanford Hoisting and Rigging Manual, Section 14.4.7.3.

Assign a qualified signal person to verify required electrical clearance is maintained.

The work package or work instructions are complete and understood by all involved personnel involved with the lift.

Weather conditions have been considered, e.g., wind, ice, snow, electrical storms.

Maximum wind speed been identified

Has the minimum clearance between the load and the boom during the lift been checked?

Have all the rigging and apparatuses been considered in the weight calculations?

Have all saddles, chains, binders, bolts, welds, and other securing devices been freed from the load before lifting is attempted?

Have softeners been utilized to protect corners?

Is there anything inside the load that could shift during the lift?

Will the lifting beams and other rigging hardware remain safely clear of the boom, the load, and other objects during the lift?

Correct crane(s) forklift truck(s) is/are identified and have been inspected. Load, foundation, and crane set-up verified. Is the crane level with 1 degree of level? Has the crane been checked with a 4-foot level or other acceptable method? The target level in the cab can be used, but should not be considered reliable for critical lifts.

Outrigger pads for mobiles are selected based on crane outrigger float size (approx. three times the area of crane float) with a minimum of 2-ft square for up to 22 ton; 3-ft square for up to 90 ton; 4- ft square for 110 ton. Crane mats shall be considered for crawler crane set-up.

Lifting points or attachment points have been inspected. Verification should be made of the lift points on engineered equipment with manufacturer-installed rigging hardware (eyebolts, swivel hoist rings, etc.).

The operator's manual has been verified for boom extensions, block, ball, number of parts of line, and rigging accessories weight.

When more than one crane will support the load, the intended share of load throughout the lift for each crane has been accounted for in the above check.

Sling loading has been calculated (reference sketches)

Underground obstacles such as voids and pipes that would affect safe operation of the crane and assisting equipment have been identified and evaluated as not to be a hazard.

Loads outside the fork truck's load center, the forklift manufacturer's instructions must be consulted. If the manufacturer's instructions are not available, field calculations may be used to estimate the reduced lifting capacity.

Have the shackle pins been checked to assure they fit the holes provided? Are the dimensions of the lifting lugs-pad eyes consistent with the shackles proposed? Will there be clearance when the shackle turns from horizontal to vertical?

Has the appropriate design safety factor been used for designing the lifting lugs?

Does the crane(s) have to travel with the load? Is the travel path compacted properly?

Has the travel and swing path been looked at for obstructions?

Has the transport route been checked for overhead obstructions?

Landing the lifted load

Is there adequate space for delivery/removal of the load transport vehicle without endangering operating personnel?

Will the lifted load remain clear of all obstructions throughout the lifting path?

Can rigging personnel control and manipulate the lifted load throughout the entire lifting path without exposing themselves to undue danger?

Have all loose objects been secured or removed to prevent falling from the load during the lift?

Has the load been prepared for placing in its final location by clearing bolt holes, removing temporary brackets, etc?

7.0 CRITICAL LIFT INSTRUCTIONS (topic header item)

- Provide a detailed description of the exact lifting operation including all aspects of the lift succession from start to completion.
- Verify item can be installed in the field as planned, i.e., physically look at the field condition, photographs, and drawings. Verify that dowels/pins/bolts in the field mate/match up with the equipment to be installed.
- Reference information may need to be obtained from the planner, system engineer, rigging engineer, FWS, or the rigging supervisor to ensure the work sequence is detailed as required to support the riggers/crane operator completing the lifting operations and provide information in the pre-job meeting.
- Attach additional pages as necessary of written direction, sketches, and drawings as necessary to ensure this lift instruction can be followed in the field.
- Verification of hold points and check points should be established for sign off to provide the documented record of the lift. This includes the assigning of the DL/lift director by the manager of the critical lift.

8.0 PRE-LIFT MEETING (topic header item)

A pre-lift or pre-job meeting shall be held and a roster with names of attendees and dates shall be attached as part of this lift plan document.

9.0 Sketches (topic header item)

Need to show the equipment and rigging hardware in the configuration it will be used to make the lift(s). Sketches do not have to be drawn to scale, but should show the following as a minimum:

- Dimensions of item to be lifted
- Dimensions of the lifting pick points
- The center of gravity is identified; how was it determined and is it marked on the load?
- Lift points shall be identified
- Method(s) of attachment and hitch configuration for slings are identified
- Capacity and tension on slings, rigging hardware, and lifting devices at the configuration shown have been calculated
- Sling angles are identified
- Accessories used (softeners, dunnage etc)

Other factors affecting the equipment capacity such as, but not limited to, D/d ratio or temperature ratings on rigging hardware are identified when applicable.

Rated capacity of the cranes or forklifts in the configuration(s) in which it will be used. For mobile cranes, many factors affect rated capacity, including boom length, boom angle, and work area (radius). Forklift attachment(s) that effect capacity shall be identified.

Load path and height when applicable. For lifts with mobile cranes, include the crane position(s) relative to the load and relative to surrounding obstructions. Where appropriate, include floor or soil-loading diagrams.

A note(s) indicating lifting, travel speed, and height limitations when applicable. This may be noted on the load-path sketch or in the lift plan document.

Attachment points (quantity, spacing distance, size, and type). Engineered lifting attachment points must identify configuration. Identify the pin diameter for applicable lifting bails and whole size for lifting lugs. Non-engineered lifting attachment points shall be identified and show a completed analysis to ensure structural integrity during the lifting operation:

- Known boom tip height, boom angle, boom length, lift radius
- Crane or forklift configuration
- Load deductions are know and listed

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